

Theorizing Teacher Epistemology: An Exploratory Case Study of Primary and Secondary Schools in the Philippines



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Abstract

Five epistemological belief dimensions were identified from a survey study of a sample of 1068 practicing Filipino teachers from 14 primary and secondary Catholic schools. The dimensions of epistemological beliefs of this sample—identified as Authority/Expert Knowledge, Learning Effort, Learning Process, Fixed Ability, and Innate Ability—differed from previous studies that employed Chan & Elliott’s Epistemological Beliefs Questionnaire (EBQ) possibly due to differences in socio-cultural contexts. For future investigations of teacher epistemology for Philippine samples, a six-factor model of epistemological belief dimensions is proposed, which suggests an additional hypothesized dimension labeled “Access to Knowledge” that requires empirical confirmation. The relevance of the study’s findings and their implications on the participating schools were also discussed, especially in relation to staff professional development programs.

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Introduction

This article investigates the epistemological beliefs of teachers working in primary and secondary Catholic schools in the Philippines. It examines whether this sample of Filipino teachers exhibits the same or similar dimensions of epistemological beliefs identified in other samples—especially those in Asia—and whether these beliefs relate to such variables as age and gender, as well as teaching experience and other school-related factors like type of school, educational level and discipline taught. Through the findings of this study, we hope to make a contribution to the research on Filipino epistemological beliefs.

The Importance of Teacher Epistemologies

Research on teacher epistemological beliefs has flourished over the past two decades both in the West and more recently in Asia (Chan, 2010; Chan & Elliott, 2004; Hofer, 2010; Hofer & Pintrich, 1997; Schraw & Olafson, 2002). This marked increase in the investigation of teacher epistemologies—a notable shift in teacher education research from teacher behaviors and skills—stemmed from the identification of teacher beliefs as the more valuable construct in teacher education research. However, the growing consensus among researchers is that epistemological beliefs play a crucial role not only in teacher education (Chan, 2010; Pajares, 1992; Raymond, 1997; Richardson, 2003; Richardson, Anders, Tidewell, & Lloyd, 1991; Tatto & Coupland, 2003), but also in professional practice (Brownlee, 2003; Chai, 2006; Chan & Elliott, 2000; Pajares, 1992, Raymond, 1997; Richardson et al., 1991). Epistemological beliefs have also been posited to have an impact on student learning and performance (Chan & Elliott, 2000; Kuhn, Cheney, & Weinstock, 2000; Ryan, 1984; Schommer, 1994), especially in terms of the role teachers play in determining whether their students develop enabling or debilitating epistemological beliefs in relation to learning (Bernardo, 2008; Jehng et al., 1993; Schommer, 1990).

Research Gaps: Epistemological beliefs and focus on practitioners

There has been limited research to date on Filipino epistemology—particularly, teacher epistemology in the Philippines. This inquiry seeks to validate for a Filipino sample the constructs generated from studies in other Asian contexts, particularly those from the extensive research by Chan and Elliott (2000, 2002, 2004), Chai (2006, 2010), among others, in Hong Kong, Singapore, and Taiwan.

Most of the research on teacher epistemology has focused on student teachers. In a study on teacher epistemology of non-Western teachers, So and colleagues (2010) noted a significant difference in teacher conception and practice from the beginning of their in-service teacher training to their first year as classroom teachers, observing that the teacher respondents became more constructive in their beliefs and approaches to teaching after classroom practice. This practitioner-focused research investigates the epistemological beliefs of Filipino teachers with varying years of professional experience and explores the influence of teaching experience on their epistemological beliefs. Aside from age and gender, this study explores whether and how epistemological beliefs relate to the teachers' professional experience, as well as other school variables.

The inquiry addresses the following research questions: (1) What are the epistemological beliefs reported by Filipino teachers working in primary and secondary schools? And (2) Are there significant differences in their epistemological beliefs in terms of age, gender, teaching experience, and such school-related factors as school type and discipline taught?

Scope and Limitations

One strength of the present inquiry is that it attempts to relate epistemological beliefs to a variety of variables. It examines the relation of the respondents' epistemological beliefs not only with their age and gender, but with its focus on actual practitioners, also with their years of teaching practice, grade level taught, discipline taught, and type of school.

It must be noted though that the sample of primary and secondary school teachers for the study was drawn from a network of Catholic religious schools. Future studies will be required to determine whether or not findings here are also representative of nonsectarian primary and secondary schools.

While significant statistical results were obtained in the various correlation and variance studies, the subsequent analyses yielded only weak to moderate practical results. Hence, one limitation of the present study is that its findings are not conclusive in terms of predicting the relationships under investigation.

Literature Review

Interested specifically in the effect of personal epistemologies on learning, Schommer (1990) proposed a theory that constituted a marked shift in epistemological research. Previous models had been premised on the unidimensionality of epistemologies—i.e., beliefs about knowledge and knowing are integrated hierarchically, cutting across disciplines and domains, and develop simultaneously (Hofer, 2000; 2010). Such a simplified conceptualization failed to capture the complex nature of epistemological beliefs and concealed their links to learning (Schommer, 1994). She proposed a re-conceptualization of personal epistemology as a belief system made up of relatively independent dimensions. An individual may, therefore, exhibit greater sophistication in certain epistemological dimensions, while remaining relatively naive in others (Schommer, 1990). Her theory of multidimensional epistemological beliefs enabled her to posit that specific beliefs develop apart or individually from one another, and that different combinations exerted varying effects on different aspects of learning, each of which could be studied separately (Schommer, 1994).

Epistemological research in the Philippines.

Only a handful of such studies have been conducted among Filipino teachers (Bernardo, 2008, 2009; Magno, 2010). In his study of the epistemological beliefs of 864 pre-service Filipino teachers, Bernardo (2008) administered an adapted version of the Schommer's Epistemological Questionnaire (SEQ) in English and Filipino, and identified two dimensions of epistemological beliefs: Simple Learning and Structure Learning, which he later renamed as Complexity of Learning ("Learning is simple, bare, elementary, uncomplicated, or it is complex and can thus be critiqued, improved and elaborated.") and Structure of Learning ("The learning process ought to have organization, precision, and certainty, or learning is loose, inexact, and even ambiguous.") (Bernardo, 2009, p. 165). According to Bernardo (2008), these two dimensions are premised on a belief that knowledge is simple—an alleged consequence of the Philippine basic education curriculum which prescribes learning goals of this nature. The two understandably exhibited strong negative correlations since only those who believe that learning processes can be complex and problematic would value structure in the learning process (Bernardo, 2008). Magno's (2010) study of 362 pre-service teachers from five colleges and universities in Manila used Bernardo's two-factor model and found

that beliefs about Complexity of Learning and Structure for Learning predicted how education was valued.

It is worth noting that these Philippine-based studies have opted to use the SEQ rather than Chan & Elliott's (2002) EBQ, which is the more commonly used instrument with its more replicable four-factor model for Asian samples. Moreover, the factorial structure of epistemological beliefs resulting from the above-mentioned studies includes purely learning beliefs and leaves out the more direct epistemological beliefs on the nature and source of knowledge. Finally, like those in other Asian cultures, these studies have focused on teacher education students or pre-service teachers rather than actual practitioners, therefore, leaving unexamined the question of how teachers' beliefs change as they mature in professional practice (Cady, Meier, & Lubinski, 2006; Chai et al., 2008).

Factors Relevant to Epistemological Beliefs

Various longitudinal and cross-sectional studies have identified educational level and experience as factors more crucial to epistemological development than age (Kuhn et al., 2000; Perry et al., 1968; Schommer, 1998; Tabak & Weinstock, 2008). Academic discipline or field of study has also been shown to be a significant determinant of epistemological beliefs in a study of 386 American university students (Jehng et al., 1993). Based on data collected through their Epistemological Belief Inventory from 24 teachers, Schraw and Olafson (2002) found differences in such beliefs in relation to the teachers' experience: The more experience a teacher acquired, the more naive they tended to be with regard to their views about the nature and source of knowledge.

School-related factors. Epistemological beliefs emerge through a process of enculturation and social construction, conditioned by their surrounding culture and context (Jehng et al., 1993; Pajares, 1992). For teachers, therefore, the school environment plays an important role in shaping epistemological worldviews and beliefs. In their study of practicing teachers, Schraw and Olafson (2002) mention the school district's prescriptive ways of teaching and learning and the culture of teaching prevalent in a school, both of which emphasize and reinforce particular epistemologies.

The Research Design

This inquiry employed survey research methods. The survey proper utilized an instrument adapted for the Asian context from Schommer's original formulation. Chan and Elliott's (2002) adaptation of the Epistemological Beliefs Questionnaire (EBQ) used originally to identify the epistemological beliefs of Hong Kong teachers.

Research Participants

Teachers from seven primary schools and eight secondary schools in the Philippines were invited to participate in this project. The schools, which belong to a network owned and managed by a Catholic religious congregation, are located in different parts of the country. Two primary schools and two secondary schools are in Metro Manila, the National Capital Region (NCR); one secondary school in Southern Luzon. Two primary schools and two secondary schools are located in the Visayas, and three primary schools and three secondary schools are in Mindanao.

Table 1
Demographic variables of respondents (N=1068)

		Number	Percent %
Age	25 years old and below	195	18
	26 to 30 years old	304	29
	31 to 35 years old	181	17
	36 to 40 years old	139	13
	41 to 45 years old	86	8
	46 to 50 years old	59	6
	51 to 55 years old	44	4
	56 to 60 years old	46	4
	Above 60 years old	10	1
	No answer	4	
	Total	1068	100
Gender	Male	322	30
	Female	736	69
	No answer	10	1
	Total	1068	100
Education level taught	Primary school	492	46
	Secondary school	576	54
	Total	1068	100
Teaching experience	Novice (1 to 3 years)	196	18
	Junior (4 to 10 years)	393	37
	Senior (11 to 20 years)	279	26
	Veteran (more than 20 years)	175	16
	No answer	25	2
	Total	1068	100
Discipline taught	Hard	131	12
	Soft	763	72
	No answer	174	16
	Total	1068	100
School type	NCR schools (2)	333	31
	Large provincial schools (3)	505	47
	Small provincial schools (3)	230	22
	Total	1068	100

Out of the 1341 teachers in the participating schools, 1127—or 84%—completed the survey. The 16% who did not participate were either absent for various reasons during the day of the administration, or simply did not volunteer to join the survey. Of these, 59 were Chinese language teachers who were mostly recruited from Mainland China with inadequate English language proficiency, so they were excluded from the study. The remaining 1068 (80%) constituted the final sample for the study.

The age of the 1068 teacher respondents ranged from 19 to 68 years old, with almost half of them below 30 years of age (47%), about a third between 31 to 40 years old (30%). Very few were in their 50's (8.4%) and 60's (0.9%). Among the respondents, 30% (or 322) were male teachers, while the majority (69% or 736) were female. 46% (or 492) were primary school teachers, while 54% (or 576) taught in the secondary school. In terms of teaching experience, a little over one-third of them have taught for four to ten years (37%) and over one-fourth have taught for 11 to 20 years (26%), while 16% have taught for more than 20 years. 18% are considered novice teachers with only one to three years of teaching experience.

Among the teachers, only about 12% taught the “hard” disciplines (Science and Math), while nearly $\frac{3}{4}$ taught in the “soft” disciplines (English, Filipino, Values Education/Religion, Social Sciences, etc.). Based on a classification derived from the schools’ resources (annual tuition revenues based on student population and average tuition fees per student), nearly half of the respondents (47%) were from the large provincial schools, while about a third (31%) came from the NCR schools, and one fourth (23%) from the smaller provincial schools.

As a result of the Philippine educational system, the respondents were bilingual in English and Filipino. Given the English proficiency requirement for employment in these schools (a standard requirement except for Chinese language teachers hired from Mainland China), all the respondents were assumed to be adequately proficient in English. As Bernardo (2008) found in his study of Filipino pre-service teachers, the resulting structure of the epistemological beliefs was not different whether the instrument was in English or Filipino. For this reason, the present study has opted not to have a Filipino translation of the EBQ.

Data Collection and Analysis

Before the main survey, demographic data were collected such as age, gender, years of teaching experience, subjects and grade level taught. Since the research on practicing teacher epistemologies has been scant, there is ample room for investigating the role of school-related factors such as teaching experience, type of school where one teaches, as well as educational level and academic discipline taught.

Epistemological Beliefs Questionnaire (EBQ)

The EBQ was designed by Chan and Elliot (2002) to assess dimensions of Hong Kong teachers’ epistemological belief. Presented with 30 statements about knowing, knowledge and learning, the respondents were asked to express their agreement or disagreement through a five-point Likert scale: from one (“Strongly Disagree”) to five (“Strongly Agree”).

The EBQ was developed when Chan & Elliott (2002) administered the 63-item Schommer Epistemological Questionnaire (SEQ) on 385 teacher education students in Hong Kong, but failed to replicate Schommer’s predicted four-factor epistemological beliefs model. One hypothesized dimension, Omniscient Authority that had not loaded in her sample of 266 American junior college and university students (Schommer, 1990) was identified in a sample of 352 Hong Kong student teachers (Chan & Elliott, 2000).

Citing cultural differences, Chan & Elliott abandoned Schommer’s questionnaire in order to develop their own EBQ. In a study that examined the relation between epistemological beliefs and conceptions about teaching and learning, the EBQ yielded a four-factor structure for its sample of 385 Hong Kong student teachers: Authority/Expert Knowledge (AEK), Certainty Knowledge (CK), Learning Effort/Process (LEP), and Innate/Fixed Ability (IFA) (Chan & Elliott, 2002). The EBQ employs four subscales to represent the four epistemological belief dimensions so that each respondent can be plotted along the continuum on the four dimensions.

Epistemological Beliefs of Filipino Teachers

Exploratory factor analysis and Varimax Rotation (with eigen value greater than 1 and scree plot test) were applied to the EBQ item responses on a Likert five-point scale. The first

Table 2

Loading for five factors with eigenvalues greater than 1.00 as cut-off (PAF: Varimax rotated factor matrix) in descending order

	1	2	3	4	5
LEP26 If one tries hard enough, then one will understand the course material.	.707				
CK14 Anyone can figure out difficult concepts if one works hard enough.	.705				
LEP18 How much you get from your learning depends mostly on your effort.	.630				
LEP10 If people can't understand something right away they should keep on trying.	.566				
LEP22 One learns little if one does not work hard.	.517				
LEP29 Understanding course materials and thinking process are more important than acquiring knowledge/facts.		.796			
LEP23 Knowing how to learn is more important than the acquired facts.		.781			
LEP19 People will learn better if they focus more on the process of understanding rather than the facts to be acquired.		.764			
AEK08a Even advice from experts should often be questioned.			.729		
AEK01a Sometimes I don't believe the facts in textbooks written by authorities.			.685		
AEK12a I often wonder how much experts really know.			.628		
AEK21 I have no doubts in whatever the experts say.			.613		
IFA28 There isn't much you can do to make yourself smarter as your ability is fixed at birth.				.690	
IFA20 Students who begin school with "average" ability remain "average" throughout.				.679	
IFA25 Our abilities to learn are fixed at birth.				.676	
IFA07 Some people are born good learners; others are stuck with limited abilities.					.801
IFA24 Some children are born incapable of learning well in certain subjects.					.723
IFA11 Our innate ability limits what one can do.					.538

Note: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 6 iterations with 51.572% cumulative variance explained. Only loading values greater than 0.4 are shown here.

*The scales for these three items for Authority/Expert Knowledge were reversed for the analysis

analysis resulted in 25 items (loading value greater than 0.4) which loaded on eight factors. Only items with factor loading equal to or greater than 0.4 were retained in the extracted factors following the stricter standards employed by Chai and colleagues in their study of epistemological beliefs of South Chinese student teachers (Chai, Deng, Qian, & Wong, 2010). Components with less than two items were subsequently omitted one at a time to determine if the structure would improve. The entire process involved omitting a total of 12 items, which eventually resulted in the emergence of a five-factor structure (cf. Table 2).

The resulting five factors represent the subscales or dimensions of epistemological beliefs identified within the sample of Filipino teachers. The five epistemological belief dimensions were named as follows: Learning Effort, Learning Process, Authority/Expert Knowledge, Fixed Ability, and Innate Ability.

None of the items for Certainty Knowledge loaded for this sample, except for CK14, which clustered with the four items for Learning Effort. Careful reading of the said item revealed that it dealt with the need for effort in “figuring out difficult concepts,” resembling very much the other Learning Effort items, especially LEP26.

Worth noting here is the splitting of Learning Effort/Process into two sets of items: The first set of four items referred exclusively to effort (labeled “Learning Effort”), while the other three focused on process (hence, “Learning Process”). The same phenomenon was observed by Chai, Teo, and Lee (2008) when a differentiation between the same two constructs occurred for their sample of Singaporean pre-service teachers.

A similar pattern was noted for Innate/Fixed Ability, which broke into two distinct factors. An analysis of the items that loaded separately showed that while one set of items referred specifically to beliefs about the unchanging and fixed nature of our learning ability (IFA28: “There isn’t much you can do to make yourself smarter as your ability is fixed at birth.”), the other set dealt with how our innate abilities limited our learning (IFA24: “Some children are born incapable of learning well in certain subjects.”). In other words, this sample seemed to make a distinction between Fixed Ability and Innate Ability. Believing that innate abilities are capable of constraining learning is not identical with believing that abilities are fixed and do not change. These two factors were labeled “Innate Ability” and “Fixed Ability.”

Correlation analysis

The results of this inquiry support Schommer’s theory that epistemological beliefs are multidimensional. Significant correlations were found among most of the dimensions ($p < .05$ and $p < .01$). The only pairs that did not register any significant correlations were: (a) Learning Effort and Authority/Expert Knowledge, (b) Learning Effort and Innate Ability (cf. Table 2).

Table 3
Correlation coefficients of pairs of epistemological belief dimensions

	LE	LP	AEK	FA	IA
Learning Effort					
Learning Process	.257**				
Authority/Expert Knowledge	-.053	-.111**			
Fixed Ability	-.222**	-.159**	.067*		
Innate Ability	-.060	-.085**	-.123**	.287**	

*Correlation is significant at the 0.05 level (two-tailed). **Correlation is significant at the 0.01 level (two-tailed).

While their practical significance may be classified weak or even negligible ($r \leq |.287|$), some of the correlations are still worth noting. The subscales expected to post significant positive statistical correlations were: (a) Learning Effort and Learning Process ($r = .257, p < .01$), (b) Fixed Ability and Innate Ability ($r = .287, p < .01$). These two pairs of epistemological beliefs dimensions used to constitute one factor each in previous studies, but the fissures resulted in four distinct factors for this particular sample. The positive association between Learning Effort and Learning Process means that while distinct, the two factors are related. The same may be said for the beliefs on Fixed Ability and Innate Ability.

Moreover, it makes sense for Learning Process and Authority/Expert Knowledge to be negatively correlated ($r = -.111, p < .01$) since one who uncritically accepts what experts say would be unlikely to value understanding and “learning how to learn.” Likewise the negative correlation between Learning Effort and Fixed Ability is also expected ($r = -.222, p < .01$) since those who believe that our abilities are fixed at birth would predictably not give importance to effort in learning.

Factors influencing teacher epistemology

Analysis of variance was conducted to determine any significant variations in epistemological beliefs with respect to: (a) age, (b) gender, (c) discipline taught (whether hard or soft), (d) type of school, (e) years of teaching experience, (f) educational level (primary or secondary school). The response data on the loaded items were clustered into the five dimensions generated from the exploratory factor analysis. The mean scores for the five subscales were computed, and one-way ANOVA was applied to them across the different groups. Similar statistical analyses were also made on the item responses to confirm the findings and to identify the specific items that accounted for the significant results.

According to the ANOVA analyses, the different demographic variables showed significant main effects only on *specific* epistemological dimensions. Most of these results were significant ($p < .01$) although in terms of practical significance, the computed effect sizes were mostly small ($\omega^2 < \text{or} = 0.2$) (cf. Table 4).

Table 4

Omega squared (ω^2) values for one-way ANOVA analyses of epistemological beliefs and demographic variables

	Age	Gender	Type of school	Discipline taught	Teaching experience	Educational level
Learning Effort		$\omega^2 = .01^{**}$	$\omega^2 = .01^{**}$			
Learning Process						$\omega^2 = .02^{**}$
Authority/ Expert Knowledge		$\omega^2 = .01^{**}$		$\omega^2 = .004^*$		$\omega^2 = .01^{**}$
Fixed Ability	$\omega^2 = .01^{**}$					
Innate Ability	$\omega^2 = .02^{**}$	$\omega^2 = .01^{**}$			$\omega^2 = .01^{**}$	

*Correlation is significant at the 0.05 level (two-tailed). **Correlation is significant at the 0.01 level (two-tailed).

* Effect sizes metric: $\omega^2 \leq .01$ (small), $\omega^2 = .06$ (moderate), $\omega^2 > .16$ (large),

Briefly, the findings were as follows: Gender was a significant factor for the most number of epistemological beliefs dimension—namely, Learning Effort, Authority/Expert Knowledge, and Innate Ability. Age and educational level taught (whether primary or secondary school) were significant for two dimensions each: Fixed Ability and Innate Ability for age, and Learning Process and Authority/Expert Knowledge for educational level. Finally, discipline taught by the teachers was a significant predictor for Authority/Expert Knowledge, while the type of school to which the teachers belonged seemed to influence their beliefs on Learning Effort. For analyses involving more than two groups such as those for age, teaching experience, and school type, a further test was performed to determine which means were significantly different from others. The Scheffe Multiple Comparison Test was selected given the unequal sizes of the groups. For the age groups, only the F values for two epistemological dimensions were found significant: Innate Ability and Fixed Ability.

Age

As expected, compared to their younger colleagues, the older teachers held beliefs about innate ability with $F(4, 1064) = 5.957, p = .000$. Surprisingly, the results are slightly different with regard to beliefs on Fixed Ability. The youngest teachers (25 and below) agreed with the oldest among them (41 and above) that our abilities do not change and are fixed at birth, with $F(4, 1064) = 3.173, p = .013$. The effect sizes were, however, small for both Fixed Ability ($\omega^2 = .01$) and Innate Ability ($\omega^2 = .02$). These results are silent on findings of previous studies of other samples that found older teachers to be less likely to accept authority (Hofer, 2001; Schommer, 1994; Schraw & Olafson, 2002). However, when the Scheffe Multiple Comparison Test was conducted, only Innate Ability posted significant differences across the age groups. The teachers with ages ranging from 26 to 30 years differed significantly from those 41 to 50 years old, $p = .004 (\leq .01)$ and those above 50 years old, $p = .013 (\leq .05)$, but not from the youngest group (25 & below) and those 31 to 40 years old. These older teachers were more inclined to believe in the limits on learning resulting from inborn ability, agreeing that some students are “born incapable of learning well” (IFA24) and are “stuck with limited abilities” (IFA07).

Gender

For gender, F values were found significant for three dimensions: (a) Learning Effort: $F(1, 1058) = 8.854, p = .003$, (b) Innate Ability $F(1, 1058) = 10.349, p = .001$, and (c) Authority/Expert Knowledge: $F(1, 1058) = 10.802, p = .001$. Female teachers tended to value effort in learning more than their male colleagues. Likewise female teachers were relatively less inclined to be critical towards experts compared to their male co-teachers. On the other hand, the males tended to believe that our innate ability imposes constraints on our learning. All effect sizes were small ($\omega^2 = .01$ for all three dimensions).

Types of school

Based on the mean scores of teachers belonging to the different types of school, only the result for Learning Effort was significant at $F(2, 1068) = 6.241, p = .002$. The effect size was, however, considered small ($\omega^2 = .01$). According to the results of the post-hoc analysis, the mean of the large provincial schools (Type 2) was significantly higher in comparison with the schools in the National Capital Region (NCR) (Type 1), $p = .003 (\leq .01)$, but not with the small provincial schools (Type 3). Contrary to expectations, therefore, teachers working in the NCR schools, compared to those in the large provincial schools, seemed less likely to credit effort for determining learning outcomes.

Discipline taught

For discipline taught, only the results for Authority/Expert Knowledge were significant at $F(1, 894) = 4.520, p = .034$, possibly due to the more technical nature of the hard disciplines and the necessary reliance on expert sources of knowledge. Compared to teachers in the soft disciplines, those teaching in the hard disciplines were less likely to entertain doubts about knowledge derived from experts. This supports what Jehng and his colleagues (1993) found in their study of the link between students' epistemological beliefs and field of study: (a) that those in the hard disciplines tended to rely on expert knowledge more than those in the soft disciplines, and (b) that one's academic discipline did not appear to be related to beliefs about ability.[1] The effect size was, however, negligible ($\omega^2 = .004$).

Teaching experience

There was only one significant F value for the teaching experience groups: Innate Ability, with $F(3, 1043) = 5.875, p = .001$. The effect size was, however, small ($\omega^2 = .01$). When the Scheffe's Multiple Comparison was conducted, Veteran teachers differed significantly in their views about innate ability when compared to their Novice and Junior counterparts, $p = .003 (\leq .01)$, and $p = .006 (\leq .01)$, respectively—but not with the Senior teachers. Schraw and Olafson (2002) observed teaching experience as significant with regard to beliefs about the nature and source of knowledge: The more experienced teachers were prone to accepting simple authoritarian views.

Educational level

In terms of educational level (whether primary or secondary), results for two epistemological dimensions were found significant: (a) Learning Process $F(1, 1068) = 21.697, p = .000$ and (b) Authority/Expert Knowledge $F(1, 1068) = 12.722, p = .000$. As expected, primary school teachers tended to be more accepting and less critical of experts and textbooks more than those teaching in the secondary school.

Also expected was the premium placed by secondary school teachers on learning processes over knowledge acquisition. The primary school teachers' greater reliance on expert sources of knowledge and their secondary school colleagues' prioritization of understanding over

mere fact acquisition are understandable and may be a function of their students' age, as well as the level of difficulty of their subject matter. Effect sizes for both are small: Learning Process ($\omega^2=.02$) and Authority/Expert Knowledge ($\omega^2=.01$).

Discussion

An epistemological beliefs model for Filipino teachers

This research supported the theory that epistemological beliefs are multidimensional, but its findings as to what these dimensions are differed from those of Chan and Elliott (2002) and Chai (2006), which investigated the epistemological beliefs of Asian student teachers from Hong Kong and Singapore, respectively.

Instead of the expected four factors from these previous administrations of the EBQ, five factors were extracted from this sample of Filipino teachers. Only one factor, Authority/Expert Knowledge, resembled the findings of the other studies. Learning Effort/Process split into two factors as did Innate/Fixed Ability, resulting in a total of five dimensions. The differences between this sample's profile of epistemological beliefs and those of previous studies may be due to the fact that while previous studies investigated Chinese student teachers, the sample of the present study consists of *practicing* Filipino teachers with varying years of teaching experience.

Epistemological profile

Based on the mean subscale scores, the epistemological beliefs for the sample may be described as follows:

- (a) Learning Effort (LE): This sample of Filipino primary and secondary school teachers appeared to recognize the value of one's effort in determining learning ($M= 4.306$, $SD= .531$).
- (b) Learning Process (LP): A higher premium seemed to be placed on understanding and "learning how to learn" rather than on mere knowledge and fact acquisition ($M= 4.091$, $SD= .769$).
- (c) Authority/Expert Knowledge (AEK): The teachers tended to have a critical stance towards the so-called expert sources of knowledge ($M= 2.421$, $SD= .653$).
- (d) Fixed Ability (FA): In general, these teachers did not believe ability to be fixed and unchanging ($M= 1.542$, $SD= .606$).
- (e) Innate Ability (IA): The teachers in the sample did not appear to agree with the view that inborn ability limits learning ($M= 2.872$, $SD= .883$).

In summary, the teachers across this sample seemed to view learning as a process that entails effort and understanding. For them, experts and authority are not the exclusive sources of knowledge. Finally, the ability to learn is not fixed nor learning limited by what one is born with. This sample of Filipino teachers can be described as exhibiting relatively sophisticated epistemological beliefs—findings that stand in contrast to Bernardo's (2008) study whose sample of pre-service teachers exhibited unsophisticated epistemological beliefs about learning. This difference may be accounted for, among others, by the differences in the sample (practicing vs. student teachers) and in the instrument (Bernardo used the SEQ).

Variables affecting epistemological beliefs

When one-way ANOVA analyses were conducted on the data to determine any significant relation between the respondents' epistemological beliefs and their demographic variables, it was observed that the results for particular dimensions of epistemological beliefs were statistically significant only for certain variables, as summarized in Table 3. For example, respondents differed in their beliefs on Learning Effort only across gender and school types. These findings show that different dimensions relate differently to different demographic variables and further confirm the multidimensional character of epistemological beliefs.

Table 5

Summary of significant differences between epistemological factor scores by demographic characteristics

Factor and demographic characteristic	Difference
Factor 1 – Learning Effort	
Gender	Female teachers value Learning Effort more than male.
Type of school	NCR schools give less importance to Learning Effort than large provincial schools.
Factor 2 – Learning Process	
Educational level taught	Secondary school teachers value Learning Process more.
Factor 3 – Authority/Expert Knowledge	
Gender	Female teachers rely more on authority knowledge.
Discipline taught	Hard discipline teachers accept expert sources more.
Educational level taught	Primary school teachers trust authoritative sources more.
Factor 4 – Fixed Ability	
Age	None significant
Factor 5 – Innate Ability	
Age	Teachers above the age of 40 believe in Innate Ability more than those between 26 to 30 years old.
Gender	Male teachers recognize that innate ability limits learning.
Teaching experience	The most experienced (Veteran) teachers regard ability as innate more than those with ten teaching years or less.

The disappearance of certainty knowledge

One important but missing dimension of epistemological beliefs is Certainty Knowledge, which deals with the nature of knowledge. Significantly, the items designed to assess this belief did not load, except for one item (CK14), which, based on its semantic, made more sense when classified with the items on Learning Effort.

The disappearance of Certainty Knowledge from the findings need not be interpreted to mean that the surveyed Filipino teachers hold no views on the matter one way or the other, or that these views do not affect their teaching. The said items may have failed to load because they had not been worded correctly enough or formulated effectively enough to assess this particular epistemological belief.

A careful reading of the concerned items provides a helpful guide to their revision. In their study, Liem & Bernardo (2010), commenting on the moderately strong and positive correlation between Certainty Knowledge and Learning Effort, called for a reformulation of the items for Certainty Knowledge. Upon closer inspection, only one of the items designed for Certainty Knowledge (CK17) explicitly tackled the nature of scientific knowledge (“Scientific knowledge is certain and does not change”), and it did *not* load. Of the remaining four items, one (CK07) focused on the need for a universal pedagogy (“I believe that there should exist a teaching method applicable to all learning situations.”), while the remaining three dealt with the importance of effort and persistence in the solution of difficult problems (CK14: “Anyone can figure out difficult concepts if one works hard enough”) and in the possible attainment of scientific truth: (a) “If scientists try hard enough, they can find the truth to almost anything” (CK02), and (b) “Scientists will ultimately get to the truth if they keep searching for it” (CK13).

One way of revising these items is to generate more items that explicitly tackle the nature of knowledge such as “Scientific knowledge is certain and does not change” (CK17). We could change the existing items’ exclusive focus on scientific knowledge, and to interrogate respondents about their views of knowledge in other domains as well, similar to the way Kuhn and her colleagues (2000) investigated their subjects’ epistemological worldviews beyond the physical sciences, assessing them in other judgment domains such as art, morality, and the social sciences.

An alternative route, however, is not so much to attempt a direct assessment of the respondents’ views about the nature of knowledge, but to gauge beliefs related to—and/or based on—this fundamental epistemological belief about the nature of knowledge. Three of the existing items in particular pertain more to one’s belief about the possibility of attaining scientific truth if one exerted enough effort rather than explicitly about the certainty of knowledge. Hofer (2000) had, in fact, proposed a fourth dimension that she labeled “perceived attainability of truth”—i.e., the possibility of ultimately attaining the truth.

In other words, the items in question seem to be measuring something *other* than beliefs about the certainty of knowledge, a slightly different though related construct, what we propose to call “Access to Knowledge.” Access to knowledge refers to the belief whether or not one can acquire knowledge through reason and effort. Is it the case that there are gaps in our knowledge simply because we have not *yet* succeeded in filling these gaps, something quite possible to achieve given adequate time and effort, or the right source? Or, is it the case that such gaps exist because the object of our knowledge—or the very nature of the

knowledge in a given domain—is not so readily “knowable” and in fact, requires cognitive construction?

Belief about access to knowledge is distinct from belief about the certainty of knowledge. The two are not identical, but they are related. Those who view that knowledge is certain and unchanging will most likely believe that they can acquire that knowledge in time. Those who subscribe to the opposite epistemological view will most probably disagree that we have such easy access to knowledge.

We propose that we refrain from directly assessing beliefs about the nature of knowledge itself—i.e., whether it is certain and unchanging or tentative and ever evolving—since very few actually think explicitly about this fundamental epistemological issue. It may be more fruitful to assess beliefs about Access to Knowledge—i.e., the possibility of achieving knowledge in different domains. This proposed epistemological beliefs dimension in lieu of Certainty Knowledge may be more practical as it deals with the *implications* of one’s belief about the nature of knowledge and may, for this reason, be more easily intelligible. The scale for the proposed dimension of Access to Knowledge would be as follows: On one end of the scale would be the more naive view that we have ready access as long as we possess the sufficient intelligence, do the necessary work, or can find a source for the knowledge desired. On the opposite lower end would be the more sophisticated view that our access to knowledge is neither easy nor even possible because it is determined not just by the availability of the required source or by our ability or effort. Our access to knowledge is conditioned and made possible by the nature of the knowledge itself because in a particular domain, the knowledge sought may not be that certain and definite, not that black-and-white, and therefore, knowledge may be achieved only through the continuing construction of knowledge.

Re-imagining a model for epistemological beliefs

There is no attempt here to claim that the five dimensions reported in this study provide an exhaustive list of epistemological beliefs for Filipino primary and secondary school teachers. Based on Chan and Elliott’s (2004) proposed multidimensional structure of epistemological beliefs, only beliefs about the nature and process of knowing (Authority/Expert Knowledge—or source of knowing—and Learning Effort/Process—or speed of knowing) have been identified in this inquiry, while beliefs about the nature of knowledge (Certainty Knowledge) are missing.

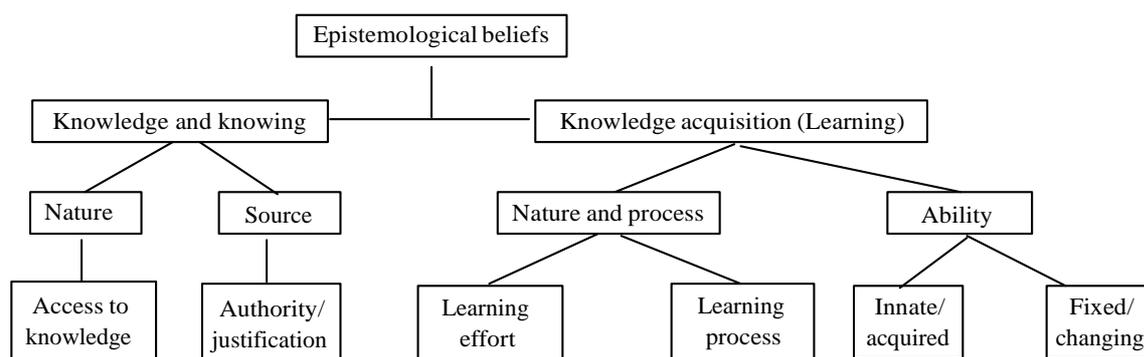
Note also that only one of the epistemological beliefs dimensions reported in this article Authority/Expert Knowledge—belongs to what Hofer and Pintrich (1997) consider core epistemological beliefs (beliefs about knowledge and knowing), while the other four are what they regard as peripheral beliefs about learning. In a critique of Schommer’s five theorized dimensions, Hofer and Pintrich (1997) described the inclusion of beliefs about learning as problematic since these beliefs, while related to epistemological beliefs, lay beyond the construct of beliefs about knowledge and knowing and, therefore, are more suitably distinguished conceptually from epistemological beliefs. The deviant patterns observed in these factors in subsequent studies, previously interpreted as an indication of the independent nature of the epistemological beliefs dimensions, might precisely be evidence that these do not properly belong to the construct of epistemological beliefs. The question remains, therefore, whether or not these dimensions ought to be considered epistemological.

A six-factor epistemological beliefs model

Given these insights, we propose an alternative model for epistemological beliefs for Filipino teachers (cf. Figure 1), one that properly distinguishes between the two main areas of epistemological beliefs: (a) beliefs about knowledge and knowing, and (b) beliefs about knowledge acquisition (or learning).

Figure 1

A proposed multidimensional structure for epistemological beliefs for Filipino teachers



Within the core beliefs about knowledge and knowing are two dimensions: (a) Access to Truth (based on one's view of the nature of knowledge), and (b) Authority/Expert Knowledge (source of knowing, or where one believes knowledge to originate). Under the more peripheral beliefs about knowledge acquisition/learning are two categories, with two dimensions each: (a) about the nature and process of learning (Learning Effort and Learning Process), and (b) about learning ability (Innate Ability and Fixed Ability).

Of the six dimensions of epistemological beliefs suggested in this model, five of them have been empirically validated in this research, while one, Access to Knowledge, remains hypothetical and requires future verification. Subsequent research will require, among others, a rewriting of the items for Certainty Knowledge so that they assess beliefs about Access to Knowledge instead.

Conclusion

This inquiry, which was conducted among 1,068 Filipino primary and secondary teachers working in a network of schools in the Philippines, yielded the following findings: With regard to the self-reported epistemological beliefs of teachers, exploratory factor analysis resulted in the extraction of five factors of epistemological beliefs: Authority/Expert Knowledge, Learning Effort, Learning Process, Innate Ability, and Fixed Ability. Based on their responses, this sample seemed to exhibit maturity in their epistemological beliefs, rating themselves high in the sophisticated learning beliefs (Learning Effort and Learning Process), while scoring low in the naive beliefs (Authority/Expert Knowledge, Innate Ability, and Fixed Ability).

In summary, older and more experienced teachers in this sample were more inclined to believe that Innate Ability impeded learning. More specifically, teachers above the age of 40

were more inclined to subscribe to beliefs about Innate Ability than those from 26 to 30 years old. Compared to their less experienced colleagues, the Veteran teachers (over twenty years of teaching experience) tended to believe that our innate abilities could impede learning. Female teachers were more likely to value experts and effort in learning, while their male colleagues tended to accept the limits resulting from one's inborn ability.

Compared to primary school teachers, those teaching in the secondary schools understandably put a higher premium in understanding than facts and knowledge. Primary school teachers and those teaching in the hard disciplines also appeared to rely more on experts as sources of knowledge. Finally—and quite surprisingly—teachers in the NCR schools valued the role of effort in learning significantly less than their counterparts in the large provincial schools.

The failure to load of the items for Certainty Knowledge is attributed to the limitations of the items intended to assess it rather than an absence of this dimension in the sample. Proposed for future investigations of Filipino teachers' epistemologies is a six-factor model of epistemological beliefs, which includes the five dimensions validated in this study and an additional hypothesized one labeled "Access to Knowledge".

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